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(54) Safe remote-control door opening-and-closing device for an automotive vehicle.

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Description

The present invention relates generally to a safe remote-control door opening-and-closing device for an automotive vehicle according to the preamble of claim 1, and more specifically to a safety device for opening or closing a vehicle door from a remote position.

A remote-control door for an automotive vehicle implies a vehicle door which can be opened or closed by the driver, at will, when he operates a control switch disposed at a position remote from the door, irrespective of other passenger's will. The remote-controlled door is usually driven by a force supplied from a power supply such as an electrical, pneumatic, or hydraulic device.

A door actuator device of that type is known from FR—A—2,078,481. In the opening cycle a DC motor drives a latch mechanism which releases the closed and locked door. In the closing cycle of an open door, an automatic locking mechanism latches and locks the door. The operator has the option of overriding the actuator device to open and to close the door manually.

However, in the case where the driver carelessly operates the door open switch to open the door, there inevitably exists a danger such that a walker or a car approaching from behind the vehicle may be obstructed by the opened vehicle door or may collide with the opened vehicle door, the opened door may hit a person standing near the vehicle or may push down a child. Further, there may arise such an accident that the opened door hits something (such as a road wall, vehicle, building, etc.), with the result that the remote-control door open-and-close mechanism is damaged or the vehicle body surface is recessed.

As described above, in the prior-art remote-control door opening-and-closing device, there exists a problem in that when the door is carelessly opened, various accidents such as collision, injury, damage, etc. may occur due to the opened vehicle door.

With these problems in mind therefore, it is the primary object of the present invention to provide a safe remote-control door opening-and-closing device for an automotive vehicle, by which where there exists an obstruction within a warning region previously determined near the door or around the vheicle, the door is not opened or the door now being opened is closed, in order to prevent an accident due to the opened door; that is, to improve safety for the remote-control door opening-and-closing device.

To achieve the above-mentioned object, the safe remote-control door opening-and-closing device according to the present invention comprises an obstruction sensor for detecting the presence of an obstruction within a warning region near the door and a switching unit connected in series between a door open switch and a door driving device in order that the door is not opened or the door being opened is closed when the obstruction detection sensor outputs a signal to the switching unit, in addition to the conventional remote-control door opening-and-closing device.

Sensors for detecting objects near a door are known e.g. in US—A—3,852,592 and US—A—4,272,921. These patents describe optically controlled, powered doors. The doors open automatically when the sensors detects a person entering into the detection range. The sensor is not used as an obstruction sensor for closing the door, but in contrast, it is the sensor for opening the door when detecting an object.

The features and advantages of the safe remote-control door opening-and-closing device according to the present invention will be more clearly appreciated from the following description taken in conjunction with the accompanying drawings in which like reference numerals designate corresponding elements and in which;

Fig. 1 is a pictorial view showing a conventional remote-control door opening-and-closing device mounted on the inside of an automotive vehicle rear door;

Fig. 2 is a schematic block diagram of an embodiment of the control unit of the safe remote-control door opening-and-closing device according to the present invention;

Fig. 3 is a schematic block diagram of an example obstruction detection sensor used with the safe remote-control door opening-and-closing device according to the present invention;

Fig. 4 is a timing chart showing various signal waveforms at various positions in the schematic block diagram of Fig. 3;

Fig. 5(A) is a perspective view of an automotive vehicle, which shows various positions at which an ultrasonic pulse transmitter and an ultrasonic pulse receiver are mounted;

Fig. 5(B) is an enlarged front view of an escutcheon portion of an outside door handle at which an ultrasonic pulse transmitter and receiver are mounted together;

Fig. 5(C) is an enlarged front view of an outside rear view mirror at which an ultrasonic pulse transmitter and receiver are mounted together;

Fig. 6 is a top view of an automotive vehicle showing an example warning region near and behind the vehicle;

Fig. 7 is a front view of an automotive vehicle showing an example warning region beside the vehicle door; and

Fig. 8 is a fragmentary top view of an automotive vehicle showing another example warning region near the opened door end.

With reference to the attached drawings, embodiments of the safe remote-control door opening-and-closing device according to the present invention will be described herebelow. Further, in this specification, only the safe remote-control device used for the left side vehicle doors are disclosed by way of example; however, it is of course possible to adopt this safe remote-control device according to the present invention for the right side vehicle doors, in particular, in the case

where the vehicle travels on "Keep-to-the-right" roads.

Fig. 1 helps to illustrate the principle of a prior-art remote-control door opening-and-closing device provided on a rear door 3 of a vehicle 1.

The remote-control door device 5 mainly comprises a door open-and-close mechanism 9 such as a hydraulic cylinder linked between the door 3 and a vehicle body 7 for opening and closing the door 3, a driving device 11 such as a DC motor for selectively driving the open-and-close mechanism 9 in the opening direction or in the reverse direction, and a control unit 15 including connecting cables for selectively operating the driving device 11 clockwise or counterclockwise. Further, in Fig. 1, the reference numeral 13 denotes a door open-and-close switch having a door open switch 13a and a door close switch 13b, the reference numeral 17 denotes a battery, and the reference numeral 19 denotes an ignition switch.

In the remote control door device 5 thus constructed, when a driver selectively operates the door open and close switches 13a and 13b, the door 3 is opened or closed, respectively, in response to these switches.

When the door 3 is opened by remote control, since a door lock and a striker (both not shown) engage each time the door is closed, the unlock lever 4 linked to the door open-and-close mechanism 9 must disengage the door lock from the striker, and then the driving device 11 can push the door 3 outward with a hinged portion 6 acting as a fulcrum, by means of the door open-and-close mechanism 9. Also, when the door 3 is closed by remote control, since the door 3 moves into with the passenger compartment wall, the door lock and the striker automatically engage and therefore the door is locked.

Fig. 2 is an example embodiment of the control unit 15 according to the present invention used with the remote-control door opening-and-closing device thus constructed, in which there is connected a switching unit 23 and an obstruction sensor 21, in addition to the conventional control unit.

As shown in Fig. 2, since the driving device 11 such as a DC motor includes a forward rotation terminal 11a and a reverse revolution terminal 11b, the door open-and-close switch 13 is connected between an ignition switch 19 connected to a battery 17 and the driving device 11 via the door open switch 13a and the door close switch 13b, respectively.

The two contacts 231 and 232 of the switching unit 23 are connected in series between the door open switch 13a of the door open-and-close switch 13 and the forward rotation terminal 11a of the driving device 11, and further the contact 233 of the switching unit 23 is connected to a point between the door close switch 13b of the door open-and-close switch 13 and the reverse rotation terminal 11b of the driving device 11 via a wire 25.

The switching unit 23 is switched from the contact 232 to the contact 233, when the obstruction sensor 21 detects that there exists an obstruction within a warning region near the door and, therefore, a signal is outputted from the obstruction sensor 21 to the switching unit 23.

That is to say, when the obstruction sensor 21 detects an obstruction, the door open switch 13a is disconnected from the forward rotation terminal 11a of the driving device 11 and is connected to the reverse revolution terminal 11b of the driving device 11. Further, in Fig. 2, the reference numeral 27 denotes a door open-and-close stopper switch turned off when the door is fully opened or fully closed.

Now follows a description of the operation of this embodiment according to the present invention with reference to Figs. 1 and 2.

First, in the case where the sensor 21 detects that there is no obstruction within a warning region near the door 3, for instance, there is no moving object such as a walker within a predetermined area on the rear side of the door or there is no object such as a vehicle within a predetermined area on the side of the door (within a range over which the door is moved), the switching unit 23 connects the door open switch 13a to the forward rotation terminal 11a of the motor 11. Therefore, when the door open switch 13a is closed while the ignition switch 19 is on, since a voltage is supplied from the battery 17, through the ignition switch 19, the door open switch 13a, the switching unit 23, the normal revolution terminal 11a of the motor 11, the stopper switch 27, to ground, a current flows through the normal revolution terminal 11a of the motor 11 in order to open the door 3 by means of the door open-and-close mechanism 9. Next, when the door close switch 13b is turned on, since a voltage is supplied from the battery 17, through the ignition switch 19, the door close switch 13b, the reverse rotation terminal 11b of the motor 11, and the stopper switch 27, to ground, a current flows through the reverse rotation terminal 11b of the motor 11 in order to drive the motor in the reverse direction, with the result that the door 3 is closed.

Next, in the case where the sensor 21 detects that there is an obstruction within a warning region near the door 3, the switching unit 23 is switched, so that the door open switch 13a is disconnected from the forward rotation terminal 11a of the motor 11. Therefore, in this case, even if the driver turns on the door open switch 13a by mistake or without confirming safety near the door, no current is passed through the forward rotation terminal 11a of the motor 11, so that the door 3 is not opened. Thus, it is possible to previously prevent an accident such that an object approaching from the rear side collides against the opened door 3, the door hits a person or an object on the door side, without any injury of other persons, any damage to the door or other objects.

Additionally, in this embodiment, in the case where the obstruction sensor 21 detects an obstruction while the door 3 is being opened, it is

possible to close the door 3. That is to say, in the case when a moving object approaching th door from the rear side thereof is not yet within the warning region when the driver turns on the door open switch 13a but coming within the warning region after the door 3 has begun opening, since the obstruction sensor 21 detects the presence of an obstruction and, thus, the switching unit 2 is switched in such a way that the door open switch 13a is disconnected from the forward rotation terminal 11a of the motor 11 and is connected to the reverse rotation terminal 11b of the motor 11, the current flowing through the forward rotation terminal 11a of the motor 11 is supplied to the reverse rotation terminal 11b of the motor 11 via the line 25 after the switching unit 23 has been switched.

Therefore, the motor 11 is driven in the reverse direction, with the result that it is possible to close the door 3 which is now being opened in order to prevent a moving object approaching the door 3 from the rear side from colliding against the opened door 3.

Further in this embodiment, it is possible to construct the above-mentioned switching unit 23 in such a way that when the obstruction sensor 21 detects an obstruction, the door open switch 13a is simply disconnected from the normal revolution terminal 11a of the motor 11. In this case, it is possible to stop the door from opening in the same manner as described above; however, in the case where an obstruction is detected by the obstruction sensor while the door 3 is being opened, the door 3 which is currently being opened can be stopped at the current position. Therefore, it is also possible to previously prevent a contact accident due to the opened door 3.

Fig. 3 is a schematic block diagram of the above-mentioned obstruction sensor 21. In the figure, the reference numeral 29 denotes a clock signal generator for generating a reference clock signal, the numeral 31 denotes a transmission timing controller for determining a pulse width W and a transmission interval T of an ultrasonic pulse signal in accordance with the clock signal generated from the clock signal generator 29, the reference numeral 33 denotes an ultrasonic pulse generator for generating a high frequency ultrasonic signal only while the transmission timing controller 31 outputs a H(High)-voltage level signal, the numeral 35 denotes an ultrasonic pulse transmitter such as a magnetostriction element for producing ultrasonic wave signals in response to the high frequency signal generated from the ultrasonic pulse generator 33.

The clock signal generator 29, the transmission timing controller 31, the ultrasonic pulse generator 33 and the ultrasonic pulse transmitter 35 are configured together within a signal transmitting unit.

Fig. 4 shows an output signal waveform S_1 generated from the transmission timing controller 31, and an output signal waveform S_2 gen rated from the ultrasonic pulse generator 33.

An ultrasonic pulse signal intermittently transmitted from the ultrasonic pulse transmitter 35 is reflected from an obstruction D near the door 3 and, next, is received by an ultrasonic pulse receiver 37, being converted into a voltage signal. The received ultrasonic pulse signal thus obtained is amplified by an amplifier 39, and only the frequency elements included in the transmitted ultrasonic wave signal are selected via a band-pass filter 41, being rectified through a rectifier 43, and next waveform-shaped via a waveform shaper 45 such as a Schmitt-trigger circuit, in order to change the waveform of the signal into a rectangular wave. Additionally, Fig. 4 show the respective output signal waveforms S_3, S_4 and S_5 of the amplifier 39, the rectifier 43 and the waveform shaper 45, respectively.

In Fig. 3, the reference numeral 47 denotes a delay circuit for delaying the signal S_1 generated from the transmission timing controller 31 by a time period corresponding to a maximum detectable distance, the numeral 49 denotes an OR gate, and the numeral 51 denotes a flip-flop which is set by the leading edge of the signal S_1 generated from the transmission timing controller 31 and is reset by the leading edge of the signal S_5 generated from the waveform shaper 45 in the case of the presence of an obstruction or the signal S_6 generated from the delay circuit 47 in the case of the absence of an obstruction. The signal waveform S_6 generated from the delay circuit 47 and the signal waveform S_7 generated from the flip-flop 51 are both depicted in Fig. 4, respectively.

The reference numeral 53 denotes a time-difference detection unit for measuring a difference in time between the transmitted ultrasonic pulse signal and the received ultrasonic pulse signal, that is, for measuring the pulse width of the signal S_7 outputted from the flip-flop 51 in order to measure the distance to an obstruction. This time-difference detection unit 53 includes a counter 53a and a latch circuit 53b.

In more detail, whenever the signal S_1 is applied from the transmission timing controller 31 to the set terminal S of the flip-flop 51, since the leading edge of the signal S_1 sets the flip-flop 51, the signal S_7 from the flip-flop 51 starts the counter 53a counting the reference clock signal generated from the clock generator 29 the instant the flip-flop 51 is set (S_7 changes to H-voltage level). On the other hand, whenever the signal S_5 or S_6 is applied from the OR gate 49 to the reset terminal R of the flip-flop 51, since the leading edge of the signal S_5 or S_6 resets the flip-flop, the signal S_7 from the flip-flop 51 stops the counter 53a from counting the reference clock signal the instant the flip-flop 51 is reset (S_7 changes to L-voltage level).

The number of the clock signals counted by the counter 53a indicates the pulse width of the signal S_7 generated from the flip-flop 51, that is, a distance from the obstruction sensor 21 to an obstruction D. The counted clock signal value is next held in the latch circuit 53b from wh n the flip-flop is set to when the flip-flop is reset.

The reference numeral 55 denotes an obstruction detection unit for detecting whether or not there is an obstruction D within a predetermined warning region near the door 3 in response to the output signal from the time-difference detection unit 53, which comprises a distance presetting device 55a for presetting any given distance and a digital comparator 55b for comparing a signal representative of a distance preset by the distance presetting device 55a with another signal representative of a distance to the obstruction D which is output from the latch circuit 53b. When a distance to the obstruction D is less than a preset distance, the output signal from the digital comparator 55b, that is, the output signal from the obstruction sensor 21 becomes, for instance, L(Low)-voltage level.

The output signal from the obstruction sensor 21 thus configured is applied to the above-mentioned switching unit 23, and when a L-voltage level output signal is applied from the obstruction sensor 21, the door open-and-close switch 13 is controlled as already described.

Further, the reference numeral 57 denotes a warning lamp driver to which the output signal from the obstruction sensor 21 is applied, the numeral 59 denotes an obstruction detection indicator lamp, the reference numeral 61 denotes a buzzer driver to which the output signal from the obstruction sensor 21 is also applied, and the numeral 63 denotes a buzzer.

Now, follows a description of the operations of the obstruction sensor 21 shown in Fig. 3.

Assumption is made that a maximum detectable distance within the warning region to be preset near the door 3 is 2 m, and the minimum distance resolving power by the counter 53a is 0.1 m. Then, the minimum oscillation frequency generated from the clock signal generator 29 is as follows:

$$\frac{340\ \text{m/sec}}{0.1\ \text{m}\times 2}=1.7\ \text{KH}_z$$

because one pulse signal must be counted within a time period required for an ultrasonic wave signal to go and return a distance of 0.1 m.

A time required to go and return a maximum detectable distance of 2 m is

$$T=\frac{2\times 2}{340\ \text{m/sec}}\fallingdotseq 0.012\ \text{sec}$$

Therefore, the pulse interval T of the ultrasonic pulse signal must be more than 0.012 sec.

If the frequency of the ultrasonic signal to be used is 50 KH_z and if ten ultrasonic pulse waves are included within a pulse width W, the pulse width W must be determined as:

$$W=\frac{10}{50\times 10^3}=0.0002\ \text{sec}$$

Accordingly, when the above-mentioned door open switch 13a is closed while the ignition switch 19 is kept turned on, the power supply (battery 17) is also applied to the obstruction sensor 21 and the lamp or buzzer driver 57 or 61, (although not shown in Figs. 2 and 3) so that the obstruction sensor 21 starts transmitting and receiving the ultrasonic wave.

In more detail, on the basis of the reference clock signal generated from the clock signal generator 29, the transmission timing controller 31 generates a signal S_1 whose pulse width is W and whose pulse interval is T, as determined on the basis of the above calculations. Receiving this signal S_1, the pulse generator 33 generates an ultrasonic pulse signal S_2, in which the ultrasonic signals are included only while the signal S_1 outputs a H-voltage level signal.

As a result, an ultrasonic pulse signal S_2 is transmitted from the ultrasonic pulse transmitter 35. When this ultrasonic pulse signal is reflected from the obstruction D, the reflected ultrasonic wave is received by the ultrasonic pulse receiver 37 and is next converted into a voltage corresponding thereto.

After being amplified into the signal S_3 through the amplifier 39, being filtered through the band-pass filter 41, and next being rectified into the signal S_4 through the rectifier 43, the reflected ultrasonic signal is applied to the waveform shaper 45. This waveform shaper 45 serves to change the dull-waveform signal after rectification into a sharp-waveform rectangular signal. This waveform-shaped signal S_5 is next applied to the reset terminal R of the flip-flop 51 via the OR gate 49.

On the other hand, since a signal S_1 is being applied from the transmission timing controller 31 to the set terminal S of the flip-flop 51, the flip-flop 51 can output a signal corresponding to a difference in time between transmitted signal and received signal. As a result, as described already, the time-difference detection unit 53 outputs a signal corresponding to a distance to the obstruction D. In this embodiment, since the counter 53a counts the number of the reference clock signals to measure the time-difference, it is possible to determine the resolving power to the 0.1 m by designing the sensor system in such a way that one ultrasonic pulse signal S_2 is generated each time the signal goes and returns a distance of 0.1 m.

The obstruction detection unit 55 determines whether or not the time-difference measured and held in the time-difference detection unit 53, that is, a distance to the obstruction D is within a distance preset by the distance presetting device 55a, that is, the warning region near the door to be watched. If the distance to the obstruction D is within the warning region, the digital comparator 55b outputs, for instance, a L-voltage level signal. When this L-voltage level output signal from the obstruction sensor 21 is applied to the switching unit 23, the switching unit 23 is switched to stop the door 3 from being opened or to switch the

door 3 so as to be closed. Further, in this embodiment, in order to indicate the driver that there exists the obstruction D within the predetermined warning region near the door, the obstruction detection indicator lamp 59 comes on and the buzzer 63 begins to generate an alarm sound; therefore, the driver who turns on the door open switch 13a readily knows that the door can not be opened or closed reversely due to the presence of the obstruction D.

Further, in the above operations, in the case where there exists no obstruction within the maximum detection distance (2m in this embodiment), the pulse signal S_6 delayed via the delay circuit 47 is given to the flip-flop 51 via the OR gate 49 before the reflected and received ultrasonic pulse signal S_5 is given to the flip-flop 51. Therefore, the flip-flop 51 is reset by this delayed pulse signal S_6. As a result, the counter 53a of the time-difference detection unit 53 counts the number of the reference clock signals from when the ultrasonic pulse signal S_2 is outputted to set the flip-flop 51 to when the delayed pulse signal S_6 is outputted to reset the flip-flop. In this case, however, since the counted value corresponds to a maximum detectable distance, the value of the signal outputted from the latch circuit 53b is always greater than that preset by the distance preset device 55a. Therefore, the output signal from the comparator 55b, which is obtained by comparing the output signal from the latch circuit 53b with the output signal from the distance presetting device 55a, becomes, for instance, H-voltage level, indicating the absence of an obstruction D within the predetermined warning region near the door, with the result that it is possible to normally open the door by turning on the door open switch 13a.

Now, will be described various example arrangements of the above-mentioned ultrasonic pulse transmitter 35 and the ultrasonic pulse receiver 37, and the warning regions near the door, with reference to Figs. 5—8.

Figs. 5(A)—5(C) show representative positions where the ultrasonic pulse transmitter 35 and ultrasonic pulse receiver 37 are mounted on the vehicle 1. In Fig. 5(A), the symbol *a* designates an outside handle escutcheon, the symbol *b* designates a sash moulding, the symbol *c* designates a door guard moulding, the symbol *d* a rear pillar finisher, the symbol *e* designates a sill moulding, the symbol *f* designates a door waist moulding, the symbol *g* designates a sash corner piece, the symbol *h* designates a sash moulding, the symbol *i* designates a door guard protector, and the symbol *j* designates a body side-guard moulding. These outside handle excutcheon *a*, sill moulding *e*, etc. are attached on the outside of the door 3 at which the automatic door device is installed.

Fig. 5(B) is a fragmentary enlarged view showing a case where the ultrasonic pulse transmitter 35 and the ultrasonic pulse receiver 37 are mounted on the outside handle escutcheon *a* on the door 3.

Fig. 5(C) shows a case where the ultrasonic pulse transmitter 35 and the ultrasonic pulse receiver 37 are disposed on the housing k of an outside rear-view mirror attached on the side where the remote-control door device is disposed.

However, without being limited to special positions on a vehicle body, it is possible to mount the ultrasonic pulse transmitter and receiver at any desired positions on the basis of the predetermined warning region near the door or the vehicle body.

Figs. 6—8 show representative warning regions. Fig. 6 show the warning region A determined in the case where the ultrasonic pulse transmitter 35 and the ultrasonic pulse receiver 37 are mounted on the sill moulding *e* and the warning region B determined in the case where the ultrasonic pulse transmitter 35 and the ultrasonic pulse receiver 37 are mounted on the outside rear-view mirror *k*. In the above-mentioned warning regions A and B, a characteristic such that the ultrasonic signal propagates under a relatively large directivity is desirable. Further, as the warning region predetermined near the door, it is possible to determine not only the warning region over which the door is opened but also, or additionally where necessary, the warning region including walkers or bicycles having a high possibility of collision against the door when the forward course is obstructed by the opened door.

Fig. 7 shows the case where the above-mentioned warning region A is seen from the front side of the vehicle 1. In such a warning region A, the warning distance from the vehicle body to the obstruction D is about 1-1.5 m, so that when the obstruction sensor 21 detects the presence of the obstruction D within the warning region A, the door will not be opened even if the door open switch 13a is turned on.

Fig. 8 shows the case where the ultrasonic pulse transmitter 35 and the ultrasonic pulse receiver 37 are mounted on, for instance, the outside handle escutcheon *a* of the door 3 of the vehicle 1. In such a warning region C, the warning distance *l* is about 40—50 cm.

In this embodiment, although the door 3 is once opened when the driver turns on the door open switch 13a, when the distance *l* between the door and the obstruction D becomes smaller and smaller and finally below a predetermined warning distance, the obstruction sensor 21 detects the presence of the obstruction D within the warning region C. Therefore, in this embodiment, even if only the above-mentioned switching unit 23 is constructed in such a way that the door open switch 13a is only disconnected from the forward rotation terminal 11a of the motor 11, the door stops from being opened further at a position where the sensor 11 detects the presence of obstruction.

Further, it is possible to use a relay or a thyristor etc. for the above-mentioned switching unit 23.

As described above, in the safety device for an

remote-control vehicle door opening-and-closing devic according to the present invention, since the switching unit is connected in series with the door open switch of the control unit for controlling the driving device for operating the door open-and-close mechanism, and since this switching unit is switched in response to a signal generated from the obstruction sensor for detecting the presence of an obstruction positioned within a predetermined warning region near the door in order to disconnect the door open switch from the driving device or to operate the driving device in the reverse direction, in case of the presence of an obstruction, it is possible to stop the door from being opened, to stop the door which is currently being opened from further being opened, or to close the door which is being opened, thus preventing an accident due to the opening of the door and improving the safety of the remote control door, without injury to a walker, damage to the door itself, or damage of other objects.

Claims

1. A safe remote-control door opening-and-closing device (15) for an automotive vehicle (1) having:

— a door open-and-close mechanism (9) linked to a vehicle door for opening and closing the vehicle door;
— a driving device (11) linked to said door open-and-close mechanism for driving said door open-and-close mechanism, said driving device provided with a forward rotation terminal (11a), and a reverse rotation terminal (11b);
— a door open switch (13a) connected in series with the forward rotation terminal of said driving device for operating said driving device, when closed, in the forward direction so that the door is opened; and
— a door close switch (13b) connected in series with the reverse rotation terminal of said driving device for operating said driving device, when closed, in the reverse direction so that the door (3) is closed,

characterized in that said safe remote-control door opening-and-closing device (15) further comprises:

(a) an obstruction sensor (21) mounted on a vehicle's body (7) for detecting the presence of an obstruction within a warning region near the vehicle door and for outputting a first signal when said sensor detects no obstruction and a second signal when said sensor detects an obstruction; and

(b) a switching unit (23) having:

(b1) a first contact (231) connected to said door open switch; and

(b2) a second contact (232) connected to the forward rotation terminal, said first contact (231) being closed to said second contact in response to the first signal from said sensor (21) indicative of the absence of an obstruction (D) within the warning range (A, B) near the vehicle (1), and being opened from said second contact in response to the second signal from said sensor indicative of the presence of an obstruction within the warning range near the vehicle,

whereby the vehicle door (3) can be opened, when said door open switch (13a) is closed, in the case of the absence of an obstruction, but not opened, even if said door open switch is closed, in the case of the presence of an obstruction (D).

2. A remote-control device as set forth in claim 1, characterized in that said switching unit (23) further comprises a third contact (233) connected to said reverse rotation terminal (11b), said third contact being opened from said first and second contacts in response to the first signal from said obstruction sensor (21) indicative of the absence of an obstruction (D) within the warning range (A, B) near the vehicle (1), and being closed to said first contact in response to the second signal from said obstruction sensor indicative of the presence of an obstruction within the warning range near the vehicle, whereby the vehicle door (3) can be opened, when said door open switch is closed, in the case of the absence of an obstruction, but the vehicle door is not opened or the vehicle door now being opened is closed, when said door open switch (13a) is closed, in the case of the presence of an obstruction (D).

3. A remote-control device as set forth in either claim 1 or 2, characterized in that said obstruction sensor (21) comprises:

(a) ultrasonic transmission means (29, 31, 33, 35) for transmitting an ultrasonic pulse signal;

(b) ultrasonic receiving means (37, 41, 43, 45, 53a) for receiving the ultrasonic pulse signal transmitted from said ultrasonic transmission means and reflected from an obstruction (D) within the warning range (A, B) near the vehicle, if any;

(c) time-difference detection means (53) for detecting a time difference from when said ultrasonic transmission means transmit an ultrasonic pulse signal to when said ultrasonic receiving means receive the reflected ultrasonic pulse signal; and

(d) obstruction determination means (55) for determining whether or not there is an obstruction within the warning range near the vehicle (1) in response to the signal generated from said time-difference detection means, and for outputting the first signal to said switching unit (23) when said obstruction determination means determine that there is no obstruction and the second signal to said switching unit when said obstruction determination means determine that there is an obstruction.

4. A remote-control device as set forth in claim 3, characterized in that said ultrasonic transmission means comprise:

(a) a clock signal generator (29) for generating a reference clock signal;

(b) a transmission timing controller (31) con-

nected to said clock signal generator for outputting a transmission timing pulse signal (S_1) having a pulse width W and pulse intervals T on the basis of the reference clock signal;

(c) an ultrasonic pulse generator (33) connected to said transmission timing controller for outputting a pulse signal (S_2) including ultrasonic signals only during the time period W in accordance with the transmission timing pulse signal (S_1); and

(d) an ultrasonic pulse transmitter (35) connected to said ultrasonic pulse generator for transmitting the ultrasonic pulse signal (S_2).

5. A remote-control device as set forth in claim 4, characterized in that said ultrasonic receiving means comprise:

(a) an ultrasonic pulse receiver (37) for receiving the ultrasonic pulse signal (S_2) transmitted from said ultrasonic pulse transmitter (35) and reflected from an obstruction (D) and for outputting a signal corresponding thereto;

(b) an amplifier (39) connected to said ultrasonic pulse receiver (37) for amplifying the signal from said ultrasonic pulse receiver and for outputting a signal (S_3) corresponding thereto;

(c) a band-pass filter (41) connected to said amplifier for filtering the signal (S_3) outputted from said amplifier and for outputting a signal corresponding thereto;

(d) a rectifier (43) connected to said band-pass filter for rectifying the signal from said band-pass filter and for outputting a signal (S_4) corresponding thereto; and

(e) a waveform shaper (45) connected to said rectifier for waveform-shaping the signal (S_4) from said rectifier and for outputting a pulse signal (S_5) corresponding thereto.

6. A remote-control device as set forth in claim 5, characterized in that said time-difference detection means comprise:

(a) a flip-flop (51) the set terminal S of which is connected to said transmission timing controller (31) to set said flip-flop in accordance with the signal (S_1) transmitted from said transmission timing controller and the reset terminal R of which is connected to said waveform shaper (45) to reset said flip-flop in accordance with the signal (S_5) outputted from said waveform shaper, said flip-flop outputting a signal (S_7) corresponding thereto;

(b) a counter (53a) connected to said clock signal generator (29) and said flip-flop for counting the clock signal during a time period from when said flip-flop is set to when said flip-flop is reset; and

(c) a latch circuit (53b) connected to said counter and said flip-flop (51) for holding a signal indicative of the time value counted by said counter, said latched circuit being reset when said flip-flop is reset.

7. A remote-control device as set forth in claim 6, characterized in that said obstruction determination means (55) comprise:

(a) a distance presetting device (55a) for presetting a given distance indicating a required warning region (A, B) near the vehicle and for utputting a signal corresponding thereto;

(b) a comparator (55b) connected to said distance presetting device and said latch circuit (53b) for comparing the signal from said latch circuit with the signal from said distance presetting device and for outputting a first signal indicative of the absence of an obstruction when the time signal outputted from said latch circuit (53b) is more than the time signal outputted from said distance presetting device (55a) and a second signal indicative of the presence of an obstruction when the time signal outputted from said latch circuit is equal to or less than the time signal outputted from said distance presetting device.

8. A remote-control device as set forth in one of the claims 5—7, characterized by:

(a) a delay circuit (47) connected to said transmission timing controller (31) for delaying the leading timing controller by a time period which corresponds to a maximum detectable distance and for outputting a signal (S_6) corresponding thereto; and

(b) an OR gate (49) one input terminal of which is connected to said delay circuit (47), the other input terminal of which is connected to said waveform shaper (45), and the output terminal of which is connected to the rest terminal R of said flip-flop (51), said OR gate ORing the signal (S_5) from said waveform shaper and the signal (S_6) from said delay circuit and for resetting said flip-flop when said delay circuit outputs the signal S_6 or when said waveform shaper outputs the signal S_5,

whereby said obstruction sensor (21) is reset each time no obstruction is detected before the next ultrasonic pulse signal is transmitted from said ultrasonic pulse generator (33).

9. A remote-control device as set forth in one of the claims 3—8, characterized in that said obstruction sensor further comprises:

(a) a lamp driver (57) connected to said obstruction determination means (55) for outputting a lamp driving signal when said obstruction determination means determines that there is an obstruction within the warning range near the vehicle; and

(b) a lamp (59) connected to said lamp driver, said lamp being lighted up in response to the lamp driving signal from said lamp driver.

10. A remote-control device as set forth in one of the claims 3—9, characterized in that said obstruction sensor further comprises:

(a) a buzzer driver (61) connected to said obstruction determination means (55) for outputting a buzzer driving signal when said obstruction determination means determines that there is an obstruction within the warning range near the vehicle (1); and

(b) a buzzer (63) connected to said buzzer driver, said buzzer being actuated in response to the buzzer driving signal from said buzzer driver.

11. A remote-control device as set forth in one of the claims 5—10, characterized in that said ultrasonic pulse transmitter (35) and said ultra-

sonic pulse receiver (37) are both mounted near a door handle (a) of the vehicle door (3).

12. A remote-control device as set forth in one of the claims 5—10, characterized in that said ultrasonic pulse transmitter (35) and said ultrasonic pulse receiver (37) are both mounted on a housing (k) of an outside rear-view mirror of the automotive vehicle (1).

Revendications

1. Commande à distance de sécurité pour dispositif d'ouverture et de fermeture de portes (15) pour un véhicule automobile (1) ayant:

— un mécanisme d'ouverture et de fermeture de portes (9) relié à une porte de véhicule pour ouvrir et fermer la porte d véhicule;
— un dispositif d'entraînement (11) relié audit mecanisme d'ouverture et de fermeture de portes pour entraîner ledit mecanisme d'ouverture et de fermeture de portes, ledit dispositif d'entraînement étant pourvu d'une borne de rotation vers l'avant (11a) et d'une borne de rotation vers l'arrière (11b);
— un commutateur d'ouverture de porte (13a) connecté en série avec la borne de rotation vers l'avant dudit dispositif d'entraînement pour faire fonctionner ledit dispositif d'entraînement, quand il est fermé, en direction vers l'avant de façon que la porte soit ouverte; et
— un commutateur de fermeture de porte (13b) connecté en série avec la borne de rotation vers l'arrière dudit dispositif d'entraînement pour commander ledit dispositif d'entraînement, quand il est fermé, en direction vers l'arrière de façon que la porte (3) soit fermée,

caractérisée en ce que ledite commande à distance de sécurité pour dispositif d'ouverture et de fermeture de portes (15) comprend de plus:

(a) un capteur d'obstruction (21) monté sur une carrosserie de véhicule (7) pour détecter la présence d'une obstruction dans une région d'alarme proche de la porte du véhicule et pour émettre un premier signal lorsque ledit capteur ne détecte pas d'obstruction et un second signal lorsque ledit capteur détecte une obstruction; et

(b) une unité de commutation (23) ayant;

(b1) un premier contact (231) connecté audit commutateur de porte ouverte; et

(b2) un second contact (232) connecté à ladite borne de rotation vers l'avant, ledit premier contact (231) étant fermé contre ledit second contact en réponse au premier signal dudit capteur (21) indiquant l'absence d'une obstruction (D) dans la plage d'alarme (A, B) près du véhicule (1), et étant ouvert au loin dudit second contact en réponse au second signal dudit capteur indiquant la présence d'une obstruction dans la plage d'alarme à proximité du véhicle,

ainsi la porte du véhicule (3) peut être ouverte, lorsque ledit commutateur d'ouverture de porte (13a) est fermé dans le cas de l'absence d'une obstruction mais non ouverte, même si le commutateur d'ouverture de porte est fermé, dans le cas de la présence d'une obstruction (D).

2. Commande à distance selon la revendication 1 caractérisée en ce que ladite unité de commutation (23) comprend de plus un troisième contact (233) connecté à ladite borne de rotation vers l'arrière (11b), ledit troisième contact étant ouvert au loin desdits premier et second contacts en réponse au premier signal dudit capteur d'obstruction (21) indiquant l'absence d'une obstruction (D) dans la plage d'alarme (A, B) à proximité du véhicule (1), et étant fermé contre ledit premier contact en réponse au second signal dudit capteur d'obstruction indiquant la présence d'une obstruction dans la plage d'alarme à proximité du véhicule, ainsi la porte de véhicule (3) peut être ouverte, lorsque ledit commutateur d'ouverture de porte est fermé, dans le cas de l'absence d'une obstruction mais la porte du véhicule n'est pas ouverte ou la porte du véhicule qui est ouverte est fermée lorsque ledit commutateur d'ouverture de porte (13a) est fermé, dans le cas de la présence d'une obstruction (D).

3. Commande à distance selon l'une quelconque des revendications 1 ou 2 caractérisée en ce que ledit capteur d'obstruction (21) comprend:

(a) un moyen de transmission d'ultrasons (29, 31, 33, 35) pour transmettre un signal impulsionnel ultrasonique;

(b) un moyen de réception d'ultrasons (37, 41, 43, 45, 53a) pour recevoir le signal impulsionnel ultrasonique transmis par ledit moyen de transmission d'ultrasons et réfléchi par une obstruction (D) dans la plage d'alarme (A, B) à proximité du véhicule, s'il y en a une;

(c) un moyen de détection de différence de temps (53) pour détecter une différence de temps entre le moment où ledit moyen de transmission d'ultrasons transmet un signal impulsionnel ultrasonique jusqu'au moment où ledit moyen de réception d'ultrasons reçoit le signal impulsionnel ultrasonique réfléchi; et

(d) un moyen déterminant l'obstruction (55) pour déterminer s'il y a ou non une obstruction dans la plage d'alarme à proximité du véhicule (1) en réponse au signal produit par ledit moyen de détection de différence de temps, et pour appliquer le premier signal à ladite unité de commutation (23) lorsque ledit moyen déterminant l'obstruction détermine qu'il n'y a pas d'obstruction et le second signal à ladite unité de commutation lorsque ledit moyen déterminant l'obstruction détermine qu'il y a une obstruction.

4. Commande à distance selon la revendication 3, caractérisée en ce que ledit moyen de transmission d'ultrasons comprend:

(a) un générateur de signaux d'horloge (29) pour produire un signal d'horloge de référence;

(b) un contrôleur de temporisation de transmission (31) connecté audit générateur de signaux d'horloge pour émettre un signal impulsionnel de temporisation de transmission (S_1) ayant une largeur d'impulsion W et des inter-

valles d'impulsions T sur la base du signal d'horloge de référence;

(c) un générateur d'impulsions ultras niques (33) connecté audit contrôleur de temporisation de transmission pour émettre un signal impulsionnel (S_2) comprenant des signaux ultrasoniques uniquement pendant la période de temps W selon le signal impulsionnel de temporisation de transmission (S_1); et

(d) un transmetteur d'impulsions ultrasoniques (35) connecté audit générateur d'impulsions ultrasoniques pour transmettre le signal impulsionnel ultrasonique (S_2).

5. Commande à distance selon la revendication 4, caractérisée en ce que ledit moyen récepteur d'ultrasons comprend:

(a) un récepteur d'impulsions ultrasoniques (37) pour recevoir le signal impulsionnel ultrasonique (S_2) transmis par ledit transmetteur d'impulsions ultrasoniques (35) et réfléchi par une obstruction (D) et pour émettre un signal correspondant;

(b) un amplificateur (39) connecté audit récepteur d'impulsions ultrasoniques pour amplifier le signal dudit récepteur d'impulsions ultrasoniques et pour émettre un signal (S_3) qui lui correspond;

(e) un filtre passe-bande (41) connecté audit amplificateur pour filtrer le signal (S_3) émis par ledit amplificateur et pour émettre un signal qui lui correspond;

(d) un redresseur (43) connecté audit filtre passe-bande pour redresser le signal dudit filtre passe-bande et pour émettre un signal (S_4) qui lui correspond; et

(e) un formeur d'onde (45) connecté audit redresseur pour mettre en forme le signal (S_4) dudit redresseur et pout émettre un signal impulsionnel (S_5) qui lui correspond.

6. Commande à distance selon la revendication 5 caractérisée en ce que ledit moyen de détection de différence de temps comprend:

(a) un flip-flop (51) dont la borne d'établissement S est connectée audit contrôleur de temporisation de transmission (31) pour établir ledit flip-flop selon le signal (S_1) transmis par ledit contrôleur de temporisation de transmission et dont laborne de remise à l'état initial R est connectée audit formeur d'onde (45) pour remettre ledit flip-flop à l'état initial selon le signal (S_5) émis par ledit formeur d'onde, ledit flip-flop émettant un signal (S_7) qui lui correspond;

(b) un compteur (53a) connecté audit générateur de signaux d'horloge (29) et audit flip-flop pour compter le signal d'horloge pendant une période de temps à partir du moment où ledit flip-flop est établi jusqu'au moment où il est remis à l'état initial; et

(c) un circuit de verrouillage (53b) connecté audit compteur et audit flip-flop (51) pour maintenir un signal indiquant la valeur du temps comptée par ledit compteur, ledit circuit verrouillé étant remis à l'état initial quand ledit flip-flop est remis à l'état initial.

7. Commande à distance selon la revendication 6 caractérisée en ce que ledit moyen déterminant l'obstruction (55) comprend:

(a) un dispositif pré-établissant la distance (55a) pour pré-établir une distance donnée indiquant une région requise d'alarme (A, B) près du véhicule et pour émettre un signal qui lui correspond;

(b) un comparateur (55b) connecté audit dispositif pré-établissant la distance et audit circuit de verrouilage (53b) pour comparer le signal dudit circuit de verrouillage au signal dudit dispositif pré-établissant la distance et pour émettre un premier signal indiquant l'absence d'une obstruction lorsque le signal de temps émis par ledit circuit de verrouillage (53b) est plus que le signal de temps émis par ledit dispositif pré-établissant la distance (55a) et un second signal indiquant la présence d'une obstruction lorsque le signal de temps émis par ledit circuit de verrouillage est égal à ou inférieur au signal de temps émis par ledit dispositif pré-établissant la distance.

8. Commande à distance selon l'une quelconque des revendications 5 à 7 caractérisée par

(a) un circuit retardateur (47) connecté audit contrôleur de temporisation de transmission (31) pour retarder le contrôleur de temporisation menant d'une période de temps qui correspond à une distance maximum détectable et pour émettre un signal (S_6) qui lui correspond, et

(b) une porte OU (49) dont une borne d'entrée est connecté audit circuit retardateur (47), dont l'autre borne d'entrée est connectée audit formeur d'onde (45), et dont la borne de sortie est connectée à la borne de remise à l'état initial R dudit flip-flop (51), ladite porte OU effectuant la combinaison du signal (S_5) dudit formeur d'onde et du signal (S_6) dudit circuit retardateur et pour remettre à l'état initial ledit flip-flop lorsque ledit circuit retardateur émet le signal (S_6) ou lorsque ledit formeur d'onde émet le signal (S_5),

ainsi ledit capteur d'obstruction (21) est remis à l'état initial à chaque fois qu'aucune obstruction n'est détectée avant que le signal impulsionnel ultrasonique suivant ne soit transmis par ledit générateur d'impulsions ultrasoniques (33).

9. Commande à distance selon l'une quelconque des revendications 3 à 8 caractérisée en ce que ledit capteur d'obstruction comprend de plus;

(a) un moyen d'entraînement (57) de lampe connecté audit moyen déterminant l'obstruction (55) pour émettre un signal d'entraînement de lampe lorsque ledit moyen déterminant l'obstruction détermine qu'il y a une obstruction dans la plage d'alarme à proximité du véhicule; et

(b) une lampe (59) connectée audit moyen d'entraînement de lampe, ladite lampe étant éclairée en réponse au signal d'entraînement de lampe dudit moyen d'entraînement de lampe.

10. Commande à distance selon l'une quelconque des revendications 3 à 9 caractérisée en ce que ledit capteur d'obstruction comprend:

(a) un moyen d'entraînement (61) d'avertisseur connecté audit moyen déterminant l'obstruction

(55) pour émettre un signal d'entraînement d'avertisseur lorsque ledit moyen déterminant l'obstruction détermine qu'il y a une obstruction dans la plage d'alarme proche du véhicule (1); et

(b) un avertisseur (63) connecté audit moyen d'entraînement d'avertisseur, ledit avertisseur étant actionné en réponse au signal d'entraînement d'avertisseur dudit moyen d'entraînement d'avertisseur.

11. Commande à distance selon l'une quelconque des revendications 5 à 10 caractérisée en ce que ledit transmetteur d'impulsions ultrasoniques (35) et ledit récepteur d'impulsions ultrasoniques (37) sont tous deux montés à proximité d'une poignée de porte (a) de la porte (3) du véhicule.

12. Commande à distance selon l'une quelconque des revendications 5 à 10 caractérisée en ce que ledit transmetteur d'impulsions ultrasoniques (35) et ledit récepteur d'impulsions ultrasoniques (37) sont tous deux montés sur un boîtier (k) d'un rétroviseur externe du véhicule automobile (1).

Patentansprüche

1. Sicherheitsfernsteuerung (15) für eine Türöffnungs- und -schließeinrichtung eines Fahrzeuges (1), mit

— einem mit einer Fahrzeugtür (3) verbundenen Türöffnungs- und -schließmechanismus (9) zum Öffnen und Schließen der Fahrzeugtür (3),
— einer mit dem Türöffnungs- und -schließmechanismus (9) verbundenen Antriebseinrichtung (11) zum Antreiben des Türöffnungs- und -schließmechanismus (9), die einen Vorwärtsdrehanschluß (11a) und einen Rückwärtsdrehanschluß (11b) aufweist,
— einem in Reihe mit dem Vorwärtsdrehanschluß (11a) der Antriebseinrichtung (11) geschalteten Türöffnungsschalter (13a), durch den im geschlossenen Schalterzustand die Antriebseinrichtung (11) in Vorwärtsdrehrichtung drehbar ist, um die Fahrzeugtür (3) zu öffnen, und mit
— einem in Reihe mit dem Rückwärtsdrehanschluß (11b) der Antriebseinrichtung (11) geschalteten Türschließschalter (13b), durch den in geschlossenem Schalterzustand die Antriebseinrichtung (11) in Rückwärtsdrehrichtung drehbar ist, um die Fahrzeugtür (3) zu schließen,

dadurch gekennzeichnet, daß die Sicherheitsfernsteuerung (15) weiterhin

(a) einen mit der Fahrzeugkarosserie (7) verbundenen Hindernissensor (21) zur Erfassung von Hindernissen innerhalb eines Sicherheitsbereichs (A, B) in der Nähe der Fahrzeugtür (3) besitzt, der ein erstes Signal ausgibt, wenn er kein Hindernis (D) erfaßt und ein zweites Signal ausgibt, wenn er ein Hindernins (D) erfaßt, sowie

(b) eine Schalteinrichtung (23) aufweist, die

(b1) einen ersten und mit dem Türöffnungsschalter (13a) verbundenen Kontakt (231) und

(b2) einen zweiten und mit dem Vorwärtsdrehanschluß (11a) verbundenen Kontakt (232) besitzt, daß

— der erste Kontakt (231) mit dem zweiten Kontakt (232) in Abhängigkeit des ersten Signals vom Hindernissensor (21), das anzeigt, daß kein Hindernis (D) innerhalb des Sicherheitsbereichs (A, B) in der Nähe des Fahrzeugs (1) liegt, verbindbar sowie vom zweiten Kontakt (232) in Abhängigkeit vom zweiten Signal des Hindernissensors (21) wieder trennbar ist, das anzeigt, daß sich innerhalb des Sicherheitsbereichs (A, B) in der Nähe des Fahrzeugs (1) ein Hindernis (D) befindet, und daß
— die Fahrzeugtür (3) nur geöffnet werden kann, wenn der Türöffnungsschalter (13a) geschlossen ist, sofern kein Hindernis (D) erfaßt ist und selbst bei geschlossenem Türöffnungsschalter (13a) nicht geöffnet werden kann, wenn ein Hindernis (D) im Sicherheits-bzw. Warnbereich liegt.

2. Sicherheitsfernsteuerung nach Anspruch 1, dadurch gekennzeichnet, daß die Schalteinrichtung (23) einen dritten und mit dem Rückwärtsdrehanschluß (11b) verbundenen Kontakt (233) besitzt, der mit dem ersten (231) und zweiten Kontakt (232) bei Vorliegen des ersten Signals vom Hindernissensor (21), das anzeigt, daß kein Hindernis (D) innerhalb des Sicherheitsbereichs (A, B) in der Nähe des Fahrzeugs (1) liegt, nicht in Verbindung steht, daß der dritte Kontakt (233) mit dem ersten Kontakt (231) bei Vorliegen des zweiten Signals vom Hindernissensor (21), das anzeigt, daß sich innerhalb des Sicherheitsbereichs (A, B) in der Nähe des Fahrzeugs (1) ein Hindernis (D) befindet, in Verbindung steht, und daß die Fahrzeugtür (3) nur geöffnet werden kann, wenn der Türöffnungsschalter (13a) geschlossen und kein Hindernis (D) erfaßt ist, bzw. nicht geöffnet werden kann oder, sofern sie bereits offen ist, geschlossen wird, wenn ein Hindernis (D) erfaßt ist, selbst wenn der Türöffnungsschalter (13a) geschlossen ist.

3. Sicherheitsfernsteuerung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der Hindernissensor (21) folgende Einrichtungen enthält:

(a) eine Ultraschallsendeeinrichtung (29, 31, 33, 35) zum Aussenden von Ultraschallpulssignalen,

(b) eine Ultraschallempfangseinrichtung (37, 41, 43, 45, 53a) zum Empfang der durch die Ultraschallsende einrichtung ausgesandten und an einem Hindernis (D) innerhalb des Sicherheitsbereichs (A, B) in der Nähe des Fahrzeugs (1) reflektierten Ultraschallpulssignale,

(c) eine Zeitabstandserfassungseinrichtung (53) zur Erfassung des zeitlichen Abstandes zwischen dem Aussenden eines Ultraschallpulssignals durch die Ultraschallsendeeinrichtung und dem Empfang des reflektierten Ultraschallpulssignals durch die Ultraschallempfangseinrichtung sowie eine

(d) Hindernisbestimmungseinrichtung (55), die in Abhängigkeit eines Signals von der Zeitabstandserfassungseinrichtung (53) entscheidet, ob ein Hindernis (D) innerhalb des Sicherheitsberichs (A, B) in der Nähe des Fahrzeugs (1) liegt oder nicht, und die das erste Signal an die Schalteinrichtung (23) liefert, wenn kein Hindernis (D) innerhalb des Sicherheitsbereichs liegt und das zweite Signal an die Schalteinrichtung (23) liefert, wenn sich ein Hindernis (D) innerhalb dieses Sicherheitsbereichs befindet.

4. Sicherheitsfernsteuerung nach Anspruch 3, dadurch gekennzeichnet, daß die Ultraschallsendeeinrichtung folgende Einheiten enthält:

(a) einen Taktsignalgenerator (29) zur Erzeugung eines Referenztaktsignals,

(b) eine mit dem Taktsignalgenerator (29) verbundene Übertragungszeitablaufsteuerung (31) zur Erzeugung eines Übertragungssteuerpulssignals (S_1) mit einer Pulsbreite W und Pulsabständen T auf der Grundlage des Referenztaktsignals,

(c) einen mit der Übertragungszeitablaufsteuerung (31) verbundenen Ultraschallpulsgenerator (33) zur Abgabe eines Pulssignals (S_2), das in Übereinstimmung mit dem Übertragungssteuerpulssignal (S_1) nur während der Zeitperiode W Ultraschallsignale enthält sowie

(d) einen mit dem Ultraschallpulsgenerator (33) verbundenen Ultraschallpulsübertrager (35) zur Abstrahlung bzw. Übertragung des Ultraschallpulssignals (S_2).

5. Sicherheitsfernsteuerung nach Anspruch 4, dadurch gekennzeichnet, daß die Ultraschallempfangseinrichtung folgende Einheiten enthält:

(a) einen Ultraschallpulsempfänger (37) zum Empfang des vom Ultraschallpulsübertrager (35) ausgesandten und am Hindernis (D) reflektierten Ultraschallpulssignals (S_2) sowie zur Ausgabe eines entsprechenden Signals,

(b) einen mit dem Ultraschallpulsempfänger (37) verbundenen Verstärker (39) zur Verstärkung des Signals vom Ultraschallpulsempfänger (37) sowie zur Ausgabe eines entsprehenden verstärkten Signals (S_3),

(c) einen mit dem Verstärker (39) verbundenen Bandpaßfilter (41) zur Filterung des vom Verstärker (39) gelieferten Signals (S_3) sowie zur Ausgabe eines entsprechenden gefilterten Signals,

(d) einen mit dem Bandpaßfilter (41) verbundenen gleichrichter (43) zur Gleichrichtung des Signals vom Bandpaßfilter sowie zur Lieferung eines entsprechenden gleichgerichteten Signals (S_4) und

(e) eine mit dem Gleichrichter (43) verbundene Umformschaltung (45) zur Umformung der Wellenform des Signals (S_4) vom Gleichrichter (43) sowie zur Ausgabe eines entsprechenden Pulssignals (S_5).

6. Sicherheitsfernsteuerung nach Anspruch 5, dadurch gekennzeichnet, daß die Zeitabstandserfassungseinrichtung (53) folgende Elemente enthält:

(a) einen Flip-Flop (51), dessen Setzeingang (S) mit der Übertragungszeitablaufsteuerung (31) verbunden ist, und der in Übereinstimmung mit dem von ihr ausgegebenen Übertragungssteuerpulssignal (S_1) gesetzt wird, dessen Rücksetzeingang (R) mit der Umformschaltung (45) verbunden ist, um den Flip-Flop (51) in Übereinstimmung mit dem Signal (S_5) von der Umformschaltung (45) zurückzusetzen, wobei der Flip-Flop (51) ein entsprechendes Signal (S_7) liefert,

(b) einen mit dem Taktsignalgenerator (29) und dem Flip-Flop (51) verbundenen Zähler (53a) zum Zählen der Taktsignale während der Zeitperiode, die zwischen dem Setzen und dem Rücksetzen des Flip-Flops (51) liegt sowie

(c) eine mit dem Zähler (53a) und dem Flip-Flop (51) verbundene Halteschaltung (53b) zum Halten eines Signals, das der durch Zählung durch den Zähler (53a) ermittelten Zeitperiode entspricht, wobei die Halteschaltung (53b) zurückgesetzt wird, wenn der Flip-Flop (51) zurückgesetzt ist.

7. Sicherheitsfernsteuerung nach Anspruch 6, dadurch gekennzeichnet, daß die Hindernisbestimmungseinrichtung (55) folgende Elemente enthält:

(a) eine Abstandsvorgabeeinrichtung (55a) zur Vorgabe eines gegebenen Abstandes, der einem Sicherheits- bzw. Warnbereich (A, B) in der Nähe des Fahrzeugs (1) entspricht, sowie zur Ausgabe eines entsprechenden Signals und

(b) einen mit der Abstandsvorgabeeinrichtung (55a) und der Halteschaltung (53b) verbundenen Vergleicher (55b) zum Vergleichen des Signals von der Halteschaltung (53b) mit dem Signal von der Abstandsvorgabeeinrichtung (55a) sowie zur Ausgabe eines ersten Signals bei nichtvorhandenem Hindernis (D), wenn das Zeitsignal von der Halteschaltung (53b) größer als das Zeitsignal von der Abstandsvorgebeeinrichtung (55a) ist, und zur Ausgabe eines zweiten Signals bei vorhandenem Hindernis, wenn das Zeitsignal von der Halteschaltung (53b) gleich oder kleiner als das Zeitsignal von der Abstandsvorgabeeinrichtung (55a) ist.

8. Sicherheitsfernsteuerung nach einem der Ansprüche 5 bis 7, gekennzeichnet durch

(a) eine mit der Übertragungszeitablaufsteuerung (31) verbundene Verzögerungsschaltung (47) zur Verzögerung des Ausgangsignals der Übertragungszeitablaufsteuerung (31) über eine Zeitperiode, die dem maximal detektierbaren Abstand entspricht sowie durch

(b) ein ODER-Glied (49), dessen einer Eingang mit der Verzögerungsschaltung (47), dessen anderer Eingang mit der Umformschaltung (45) und dessen Ausgang mit dem Rücksetzeingang (R) des Flip-Flops (51) verbunden ist, durch das das Signal (S_5) von der Umformschaltung (45) sowie das Signal (S_6) von der Verzögerungsschaltung (47) gemäß der ODER-Funktion verarbeitet werden, um den Flip-Flop (51) zurückzusetzen, wenn entweder die Verzögerungsschaltung (47) ihr Signal (S_6) oder die Umform-

schaltung (45) ihr Signal (S_5) ausgeben, so daß der Hindernissensor (21), wenn kein Hindernis (D) detektiert wurde, jedesmal dann zurückgesetzt ist, bevor das nächste Ultraschallpulssignal (S_2) vom Ultraschallpulsgenerator (33) ausgesendet wird.

9. Sicherheitsfernsteuerung nach einem der Ansprüche 3 bis 8, dadurch gekennzeichnet, daß der Hindernissensor (21) weiterhin

(a) eine mit der Hindernisbestimmungseinrichtung (55) verbundene Lampensteuerung (57) zur Erzeugung eines Lampensteuersignals enthält, wenn durch die Hindernisbestimmungseinrichtung (55) festgestellt wurde, daß sich ein Hindernis (D) innerhalb des Warn- bzw. Sicherheitsbereichs (A, B) in der Nähe des Fahrzeugs (1) befindet, und daß

(b) mit der Lampensteuerung (57) eine Lampe (59) verbunden ist, die in Abhängigkeit des Lampensteuersignals von der Lampensteuerung (57) aufleuchtet.

10. Sicherheitsfernsteuerung nach einem der Ansprüche 3 bis 9, dadurch gekennzeichnet, daß

(a) eine Summersteuerung (61) mit der Hindernisbestimmungseinrichtung (55) verbunden ist, um ein Summersteuersignal zu erzeugen, wenn durch die Hindernisbestimmungseinrichtung (55) festgestellt wurde, daß sich ein Hindernis (D) innerhalb des Warn- bzw. Sicherheitsbereichs (A, B) in der Nähe des Fahrzeugs (1) befindet, und daß

(b) mit der Summersteuerung (61) ein Summer (63) verbunden ist, der in Abhängigkeit des Summersteuersignals von der Summersteuerung (61) einschaltbar ist.

11. Sicherheitsfernsteuerung nach einem der Ansprüche 5 bis 10, dadurch gekennzeichnet, daß die Ultraschallsendeeinrichtung (35) und der Ultraschallempfänger (37) beide in der Nähe eines Türgriffs (a) der Fahrzeugtür (3) angeordnet sind.

12. Sicherheitsfernsteuerung nach einem der Ansprüche 5 bis 10, dadurch gekennzeichnet, daß die Ultraschallsendeeinrichtung (35) und der Ultraschallempfänger (37) beide am Gehäuse (k) eines außen am Fahrzeug (1) angebrachten Rückspiegels angeordnet sind.

FIG.1 PRIOR ART

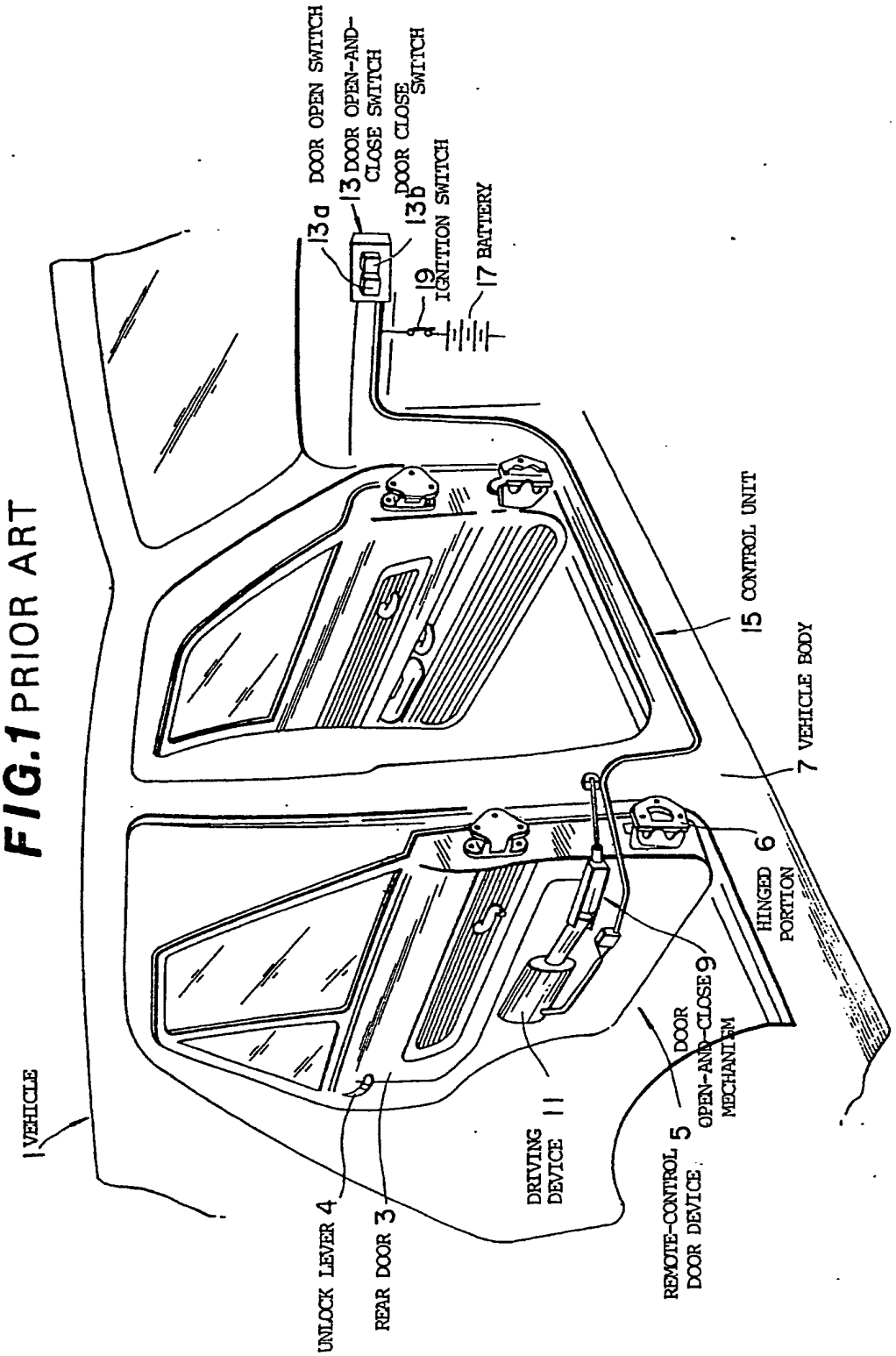

FIG.2

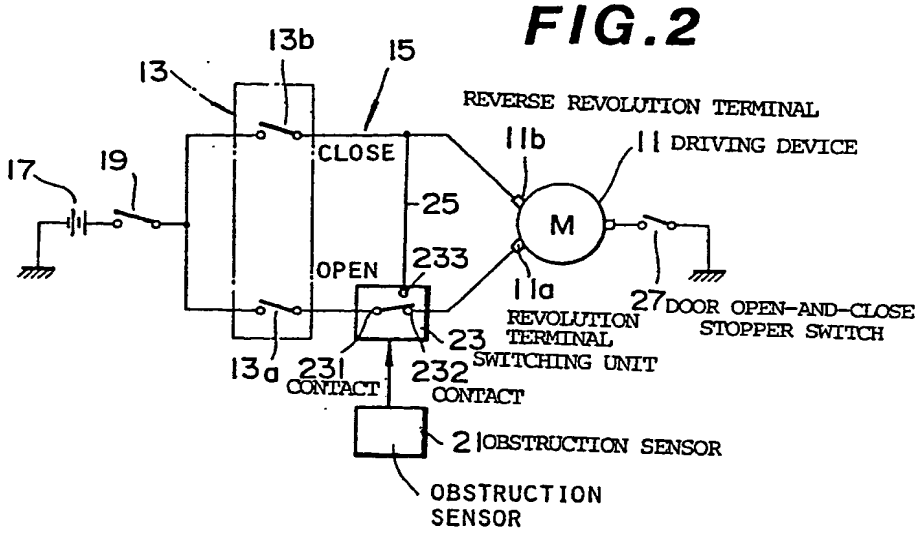
13b
15
13
REVERSE REVOLUTION TERMINAL
11b
11 DRIVING DEVICE
17
19
CLOSE
25
M
OPEN
233
11a
27
DOOR OPEN-AND-CLOSE STOPPER SWITCH
REVOLUTION TERMINAL
23
SWITCHING UNIT
13a
231
CONTACT
232
CONTACT
21
OBSTRUCTION SENSOR
OBSTRUCTION SENSOR

FIG.6

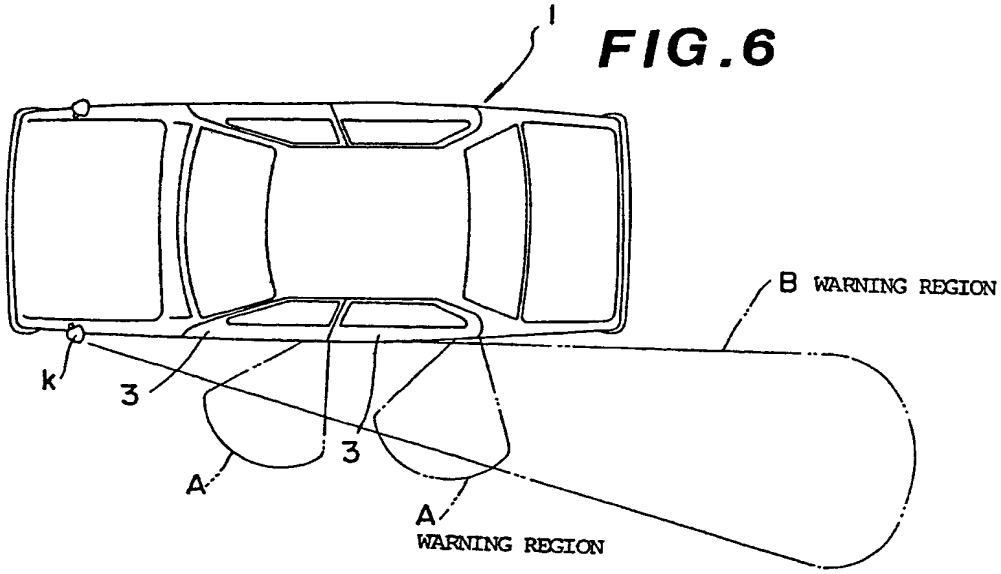
1
B WARNING REGION
k
3
3
A
A
WARNING REGION

FIG.3

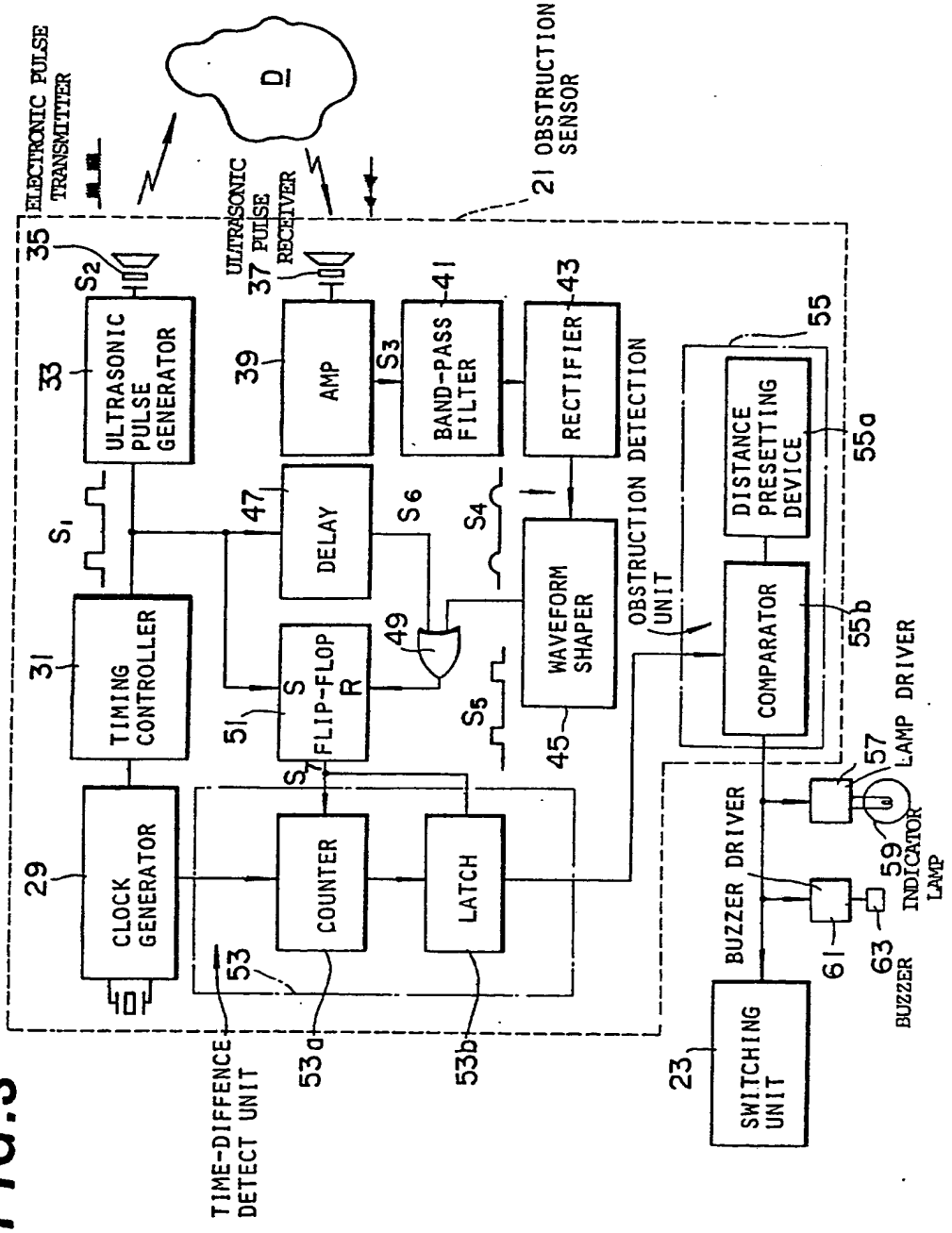
ELECTRONIC PULSE TRANSMITTER
D
21 OBSTRUCTION SENSOR
ULTRASONIC PULSE RECEIVER
35
S2
37
33
ULTRASONIC PULSE GENERATOR
39
AMP
S3
41
BAND-PASS FILTER
43
RECTIFIER
55
DISTANCE PRESETTING DEVICE
55a
S1
47
DELAY
S6
S4
OBSTRUCTION DETECTION UNIT
31
TIMING CONTROLLER
49
51
S
FLIP-FLOP
R
S7
WAVEFORM SHAPER
S5
45
COMPARATOR
55b
57
LAMP DRIVER
29
CLOCK GENERATOR
53
COUNTER
LATCH
BUZZER DRIVER
59
INDICATOR LAMP
61
63
BUZZER
TIME-DIFFENCE DETECT UNIT
53a
53b
23
SWITCHING UNIT

FIG.4

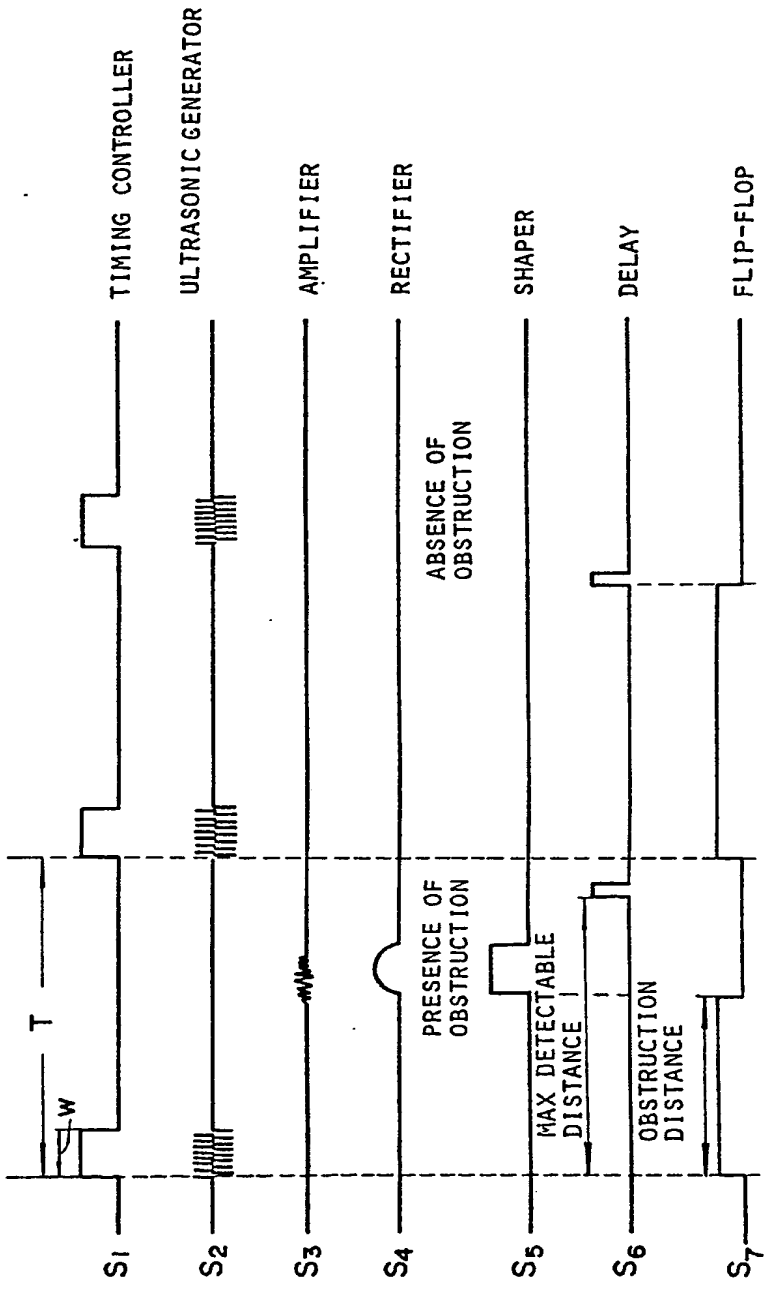
TIMING CONTROLLER
ULTRASONIC GENERATOR
AMPLIFIER
RECTIFIER
SHAPER
DELAY
FLIP-FLOP
T
W
ABSENCE OF OBSTRUCTION
PRESENCE OF OBSTRUCTION
MAX DETECTABLE DISTANCE
OBSTRUCTION DISTANCE
S1
S2
S3
S4
S5
S6
S7

FIG. 5 (A)

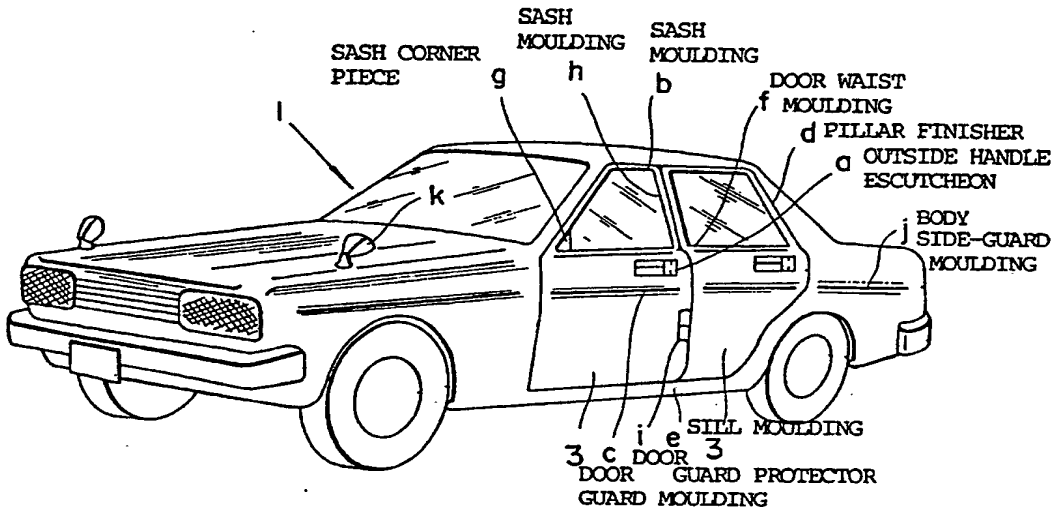

FIG. 5 (C)

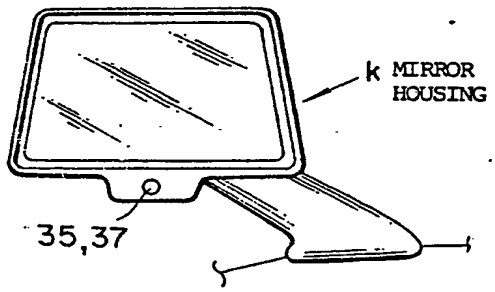

FIG. 5 (B)

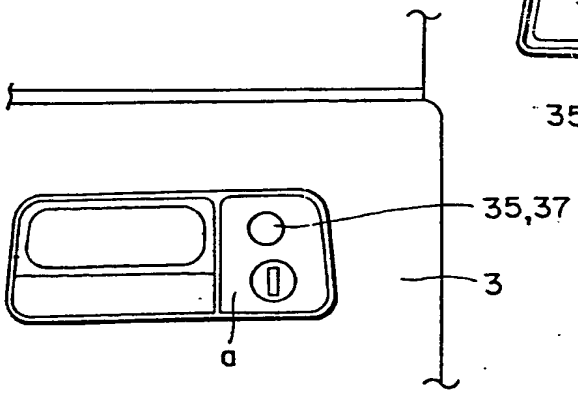

FIG.7

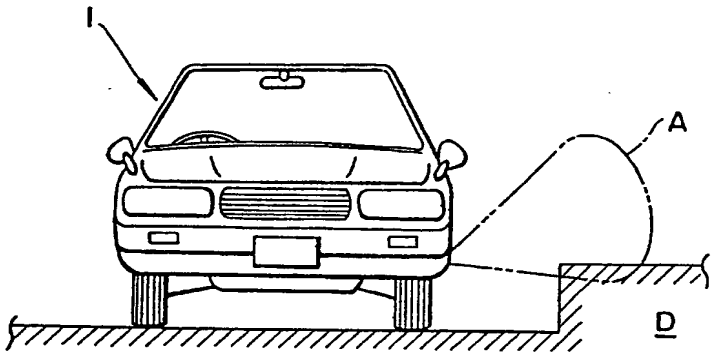

FIG.8